Available online at www.sciencedirect.com

ScienceDirect

Procedia - Social and Behavioral Sciences 104 (2013) 922 – 931

Procedia
Social and Behavioral Sciences

2nd Conference of Transportation Research Group of India (2nd CTRG)

Establishing criteria and their weights for evaluating transportation funding alternatives using a Delphi survey

Sasanka Bhushan Pulipati, Stephen P. Mattingly[1]

University of Texas at Arlington, PO Box 19308, Arlington, Texas, 76019, USA

Abstract

For more than a decade, transportation officials in the US have been concerned that, at current levels, the fuel tax, which is the primary surface transportation funding source in the US, would not provide enough revenue to satisfy the ever rising transportation needs. Political and public support for raising the fuel tax is lacking, and fuel tax revenue has not kept pace with construction costs because it is not indexed to inflation. Increase in fuel efficiency is expected to reduce the fuel tax revenue. While there are many funding alternatives such as increasing the fuel tax, replacing it with a mileage based tax, increasing sales tax and tolling, officials from transportation agencies and policy makers need to reach a consensus on the best or preferable alternative to be implemented. Due to the differences in their backgrounds as well as their objectives, they may have different priorities. In this research, the authors organize a structured communication among many Texas-based transportation officials and the Texas Legislative Committee members' staff using the Delphi method to obtain their opinions about the criteria and their weights to be used for evaluating transportation funding alternatives. Through this process, the authors try to build a consensus among the members of this expert panel by feeding back the group response for their review. The result of this survey is a set of criteria and their weights, which can be used to evaluate transportation funding alternatives for the state of Texas. The criteria weights seem to indicate that the panelists recognize the importance of public opinion and its impact on reaching a legislative solution. The panelists appear to be less concerned about criteria that may be addressed through modifications to the funding alternatives and research. This research shows that the funding policy is not seen as a tool for improving user efficiency, which opposes the common view in the literature that encourages replacement of fuel tax with a vehicle mileage tax involving high implementation and operating cost.

Keywords: Transportation funding; evaluation; criteria; weights; pairwise comparison; 100-point scale; Delphi method; Consensus;

[1] Corresponding author. Tel.: +1-817-272-2859; fax: +1-817-272-2630.
E-mail address: mattingly@uta.edu

doi:10.1016/j.sbspro.2013.11.187

1. Introduction

Traditionally, in the United States (US), motor fuel taxes have been a major source of funding for surface transportation infrastructure development and maintenance. Other user charges such as the vehicle registration fee and heavy vehicle use tax also contribute to supporting transportation infrastructure. In Texas, motor vehicle users pay 38.4 cents per gallon of gasoline and 44.4 cents per gallon of diesel including the state and federal level taxes. Since its inception in the 1910s, funding needs and construction costs have increased, and the fuel tax has been raised by the government many times to counter this. Since the last increase in 1993, the federal fuel tax has remained unchanged and since 1991, the Texas state fuel tax has been 20 cents per gallon; the lack of increase is due to a lack of support from the public and political leaders.

The National Surface Transportation Policy and Revenue Study Commission (2007) identified that the funding needs were significantly higher than the revenue expected from the existing taxes; it suggested increasing the federal fuel tax and making it more sustainable against increasing construction costs by indexing it to an inflation indicator. Furthermore, it suggested that the government should implement a mileage based tax program in the future. A 2006 report by the National Cooperative Highway Research Program (NCHRP) suggested an increase of the fuel tax to offset the increase in fuel efficiency (National Research Council (US) Committee for the Study of the Long-Term Viability of Fuel Taxes for Transportation Finance 2006). In spite of the above recommendations, the federal fuel tax remained unchanged.

As the federal funds have decreased, Texas as much as other states in the US has taken on a higher burden to raise their own funds for statewide transportation projects. Texas is the second largest and second most populous state in the US. It consists of four major metropolitan areas and many small urban and rural areas. Three of the four major cities in Texas are among the top ten populous cities in the US (United States Census 2010 2013). There have been many studies at the national and state levels in the last decade to identify potential funding alternatives and evaluate them. These evaluations often consider numerous criteria, such as revenue generation, fairness, implementation issues, political feasibility and potential improvement in efficient use of the system.

The authors want the evaluation of funding alternatives to capture different perspectives. A funding solution has a greater likelihood of adoption and success when it considers the priorities of both transportation officials and politicians. Due to the differences in their backgrounds as well as their objectives, transportation officials and policy makers may have different priorities. With this in mind, the authors establish an expert panel that includes many transportation officials situated across Texas and the staff of the Texas Legislative Committees on Transportation. The panel members identify their individual opinion on the criteria's relative importance. The authors use the Delphi method (Linstone et al. 1975) to collect these opinions and try to build a group consensus. The consensus is developed through an iterative process, where the individual responses are filtered, aggregated and returned to panel participants.

The next section introduces the Delphi method and discusses the method's applicability to this research. The third section discusses the methodology followed and some of the customizations done for this research. The fourth section shows the results of the survey and discusses some policy implications. The authors conclude the paper with some recommendations for future research.

2. The Delphi Method and its Applicability to the Current Research

Since its first use in a defense related study in the 1950s at the RAND Corporation, located in the US, (Dalkey and Helmer 1963), many researchers used the Delphi method in hundreds of applications. The Delphi method is a method for structuring communication among a group of people so that they can collectively deal with a complex problem effectively. This method allows for multiple rounds of communication with a feedback of the group judgment as well as some individual contributions. The participants get an opportunity to revise their views based

on the other expert panel member responses. To some extent, the identity of the participants is not revealed to the other participants during the communication (Linstone et al. 1975).

There are certain study considerations that help in choosing a group decision making method that is feasible and effective for this research. In this research, the authors contact a number of 'experts' who are experienced in transportation planning and financing and/or are participating in making future transportation funding policy decisions. The expert panel is expected to consist of about 20 to 25 members who are top level officials from different organizations. The panel members have busy schedules with more important jobs than this survey, but they are able to communicate by electronic mail (e-mail). A larger concern is that their opinions on the criteria and the corresponding weights may differ significantly.

The authors review different methods of group decision making and choose the Delphi method. A face-to-face discussion is usually more effective in reaching a consensus opinion (Acacio 2012). But, in this process, a few members may dominate other members. The in-person method may cost a great amount of money for the participants' travel and stay. A teleconference is cheaper, but it has other challenges such as group members being misunderstood or misinterpreted. In both these methods, scheduling is very difficult and the members may not have enough time to think and discuss. For these reasons, the Delphi method is used for this study. E-mail medium is used, because the communication turnaround is smaller and the participants are given enough time to think about their decisions and to respond at their convenience. With the feedback process, the panel members become aware of the group response and the amount of disagreement among themselves. They have an opportunity to learn from the responses of other members and revise their responses to facilitate consensus. Anonymity during the survey allows the panel members to put forward even the most opposing ideas without hesitation.

3. Survey Methodology

In this section, the authors describe the methodology followed. The first sub-section briefly describes the entire methodology. The following sub-sections describe different steps of the survey process in more detail.

3.1. Methodology

The main aim of the survey is to establish criteria and their weights for evaluating transportation funding alternatives. The authors define the 'experts' as those who are experienced in transportation planning and financing and/or participate in making future transportation funding policy decisions. The list of potential panel members consists of high level officials from the twenty five metropolitan planning organizations (MPOs) in Texas, various districts of the Texas Department of Transportation (TxDOT) and the legislative staff members of the Transportation Committees of both the House and Senate of the Texas Legislature (Leg. Comm.). The panel members are recruited by e-mail and follow up phone calls.

The survey includes three rounds of questionnaires, which is typical for the Delphi method (Skulmoski et al. 2007). The questionnaires should be concise, easy to understand and require a relatively short time to complete. The study uses pilot surveys to refine the questionnaires. In the first round, the panel members consider the importance of including the various evaluation criteria. The initial criteria come from existing literature. The most notable documents include: NCHRP Report 377 (Reno and Stowers 1994) and the final report of the National Surface Transportation Infrastructure Financing Commission (NSTIFC) (2009). In the second round, the authors provide the finalized criteria list and ask the panel members to weight them based on the relative importance of each criterion. In the third round, the panelists can revise their responses after reviewing a summary of the group response. The authors analyze the revised responses and present a final summary of the criteria weights. The list of the survey activities is shown as a flow chart in Fig. 1.

Historically, Delphi surveys have used sample sizes from four to more than one hundred depending on the research question and specific circumstances (Skulmoski et al. 2007). So, there is no typical sample size for a Delphi study. The authors aim to have at least five members in each of the three groups, namely, MPOs, TxDOT and Legislative Committees. In total, 22 members participate in Round 1 and 26 in Round 2. Sixteen members respond to Round 3. After Round 2, TxDOT officials formally withdrew from the survey due to internal directives.

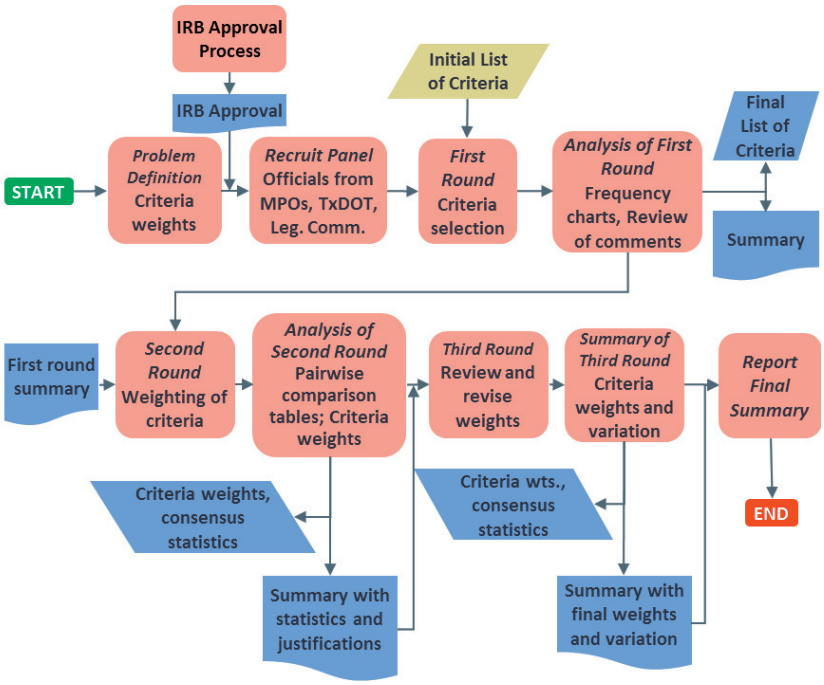
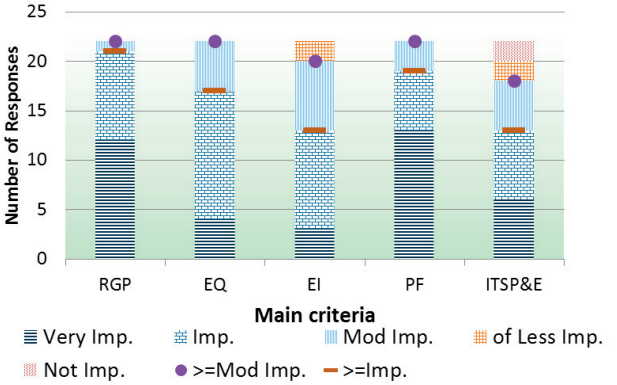


Fig. 1. Survey Activity Flow Chart

3.2. First Round Survey

The objective of the first round is to finalize a list of criteria. In the survey, the authors provide an initial list of criteria and ask the members to specify the importance of including a criterion or a sub-criterion in the evaluation process. A Likert scale (Likert 1932) of five importance levels ranging from very important to not important is used. The initial list of criteria includes five main criteria and several sub-criteria under each main criterion. The five main criteria are termed as: revenue generation potential (RGP), equity and fairness (EQ), ease of implementation (EI), political feasibility (PF) and improvement in transportation system performance and environment (ITSP&E). The panelists can provide any comments and any additional criteria they may think of.

The importance levels assigned to each criterion by the panel members as well as their comments are summarized and analyzed. Fig. 2 shows a bar chart showing the distribution of importance levels given to each main criterion. The authors include a criterion in the evaluation if it receives more than half of the responses with moderately important or above. They also review if a criterion gets very few votes for ‘very important’ and ‘important’ levels. After completing this initial screening, the authors refine the criteria based on individual responses and other literature. Table 1 shows the final criteria list. For an explanation of the criteria, the reader may refer to the full report by Pulipati (2013). All main criteria and most sub-criteria remained in the final list.



Note: For each criterion, number of panel members choosing moderately important (Mod Imp.) or more is shown using a dot and numer of panel members choosing important (Imp.) or more is shown using a horizontal bar.

Fig. 2. Bar chart showing the distribution of important levels chosen by the panel members

Table 1. Final list of criteria and sub-criteria for evaluating transportation funding alternatives

Evaluation Criteria	
Revenue Generation (RG)	Simplicity of payment structure
Revenue generation potential	Ability to prevent evasion
Revenue sustainability	Ability to use existing payment infrastructure
Revenue predictability	Ease of co-ordination with bordering regions
Flexibility in investment	
Ease of tax or fee increases when needed	**Public Acceptance and Political Feasibility (PA&PF)**
Equity and Fairness (EQ)	Ease of explaining to the public
Equity in paying by benefit gained and	Acceptability to the public
Ability to pay equity	Less need for legislative action (addition, deletion or
Geographic equity	**Potential Secondary Benefits (PSB)**
Ease of Implementation (EI)	Promotion of efficient use of system by changing travel
Cost of implementation	Promotion of fuel efficiency and use of low emission fuels

3.3. Second Round Survey – Weighting the Criteria

The objective of the second round survey is to obtain weights for the criteria from the panel members. Weights represent the importance of each decision criterion relative to all others. Rogers (2001) explains different basic techniques for calculating criteria weights based on the judgment of the decision-maker (DM) such as ranking method, ratio method and pairwise comparison method; each has some pros and cons. Another common method is where a total of 100 points are distributed among a set of criteria (100-point method) (Nijkamp et al. 1990).

The authors have two tasks: choosing the weighting methods for the main criteria and sub-criteria and identifying the best way to present them in the survey so that the panel members can easily comprehend and answer. The authors choose to use the pairwise comparison method for the main criteria because it is simple to understand and reduces the burden on the members by asking them to compare two criteria at a time. Since there are five main criteria, there are ${}_5C_2$, that is ten, pairwise comparison questions. To simplify the structure further, the authors presented these as four sets of questions, comparing one main criterion with the remaining ones in one set. After each group, the panel members are asked to provide any comments or justification for their opinion.

For weighting the sub-criteria, the authors use the 100-point method, which is direct and easy to understand. Although this method requires the panel members to compare all the sub-criteria under one main criterion at one time instead of two at a time, this problem is reduced because three of the five criteria have only three or fewer sub-criteria. In addition, the panel members have a chance to revisit their criteria weights in the next round. The authors consider the ratio method but its complexity makes it only appropriate for in-person surveys.

The authors summarize all the responses obtained and calculate the criteria weights. For the main criteria, one pairwise comparison table is prepared for each panel member. The pairwise comparisons are translated into scores of 0,1 or 2 as suggested by Rogers (2001). The authors increase all the row sums by one to avoid any zero weights. In each response, the weights are found by normalizing the row sums such that the sum is one. The sub-criteria scores on 100-point scale assigned by the panelists are directly translated into weights for the sub-criteria.

The next task is to aggregate the responses into one criteria weight vector. The authors first calculate one set of main criteria weights from each pairwise comparison table and then aggregate these sets using a weighted geometric mean method (Zhou 1996). As a measure of reliability of the responses, the authors assign a weight to each panel member's response based on the number of inconsistent responses. They use these weights as the weights in a weighted geometric mean calculation. An example of inconsistency is: RG > EQ, EQ > EI but EI > RG, where '>' is 'more important'. The sub-criteria weights are aggregated using a simple geometric mean.

In this research, the authors try to understand if there are differences in opinions among different groups of panel members. Rogers (2001) suggests the need for generating separate sets of weights when necessary. In this research, panel members are grouped based on the organization, or the region type – urban or non-urban, which may cause differences due to the difference in congestion level and the transportation needs. The criteria weights are first averaged by the group. Then, the average of all the groups is calculated as the overall average weight.

Besides the average weights, the authors prepare frequency histograms and box and whisker plots, showing the geometric mean, inter-quartile range and minimum and maximum weights, to examine the variation in the criteria weights. The average weights are considered as the potential consensus opinion. The justifications presented along with the responses are summarized, analyzed and presented to the panel members. This summary includes the resultant main criteria and sub-criteria weights, and a synthesized sub-set of panel members' comments, which may or may not support the potential consensus opinion. The results are illustrated with a graphical presentation of the main criteria weights and sub-criteria global weights, and box and whisker plots.

3.4. Third Round Survey – Efforts Towards Consensus

The aim of the third round survey is to reduce the differences among the panel members' opinions on the criteria weights and facilitate a consensus. This step is the main strength of the Delphi method. The panel members are shown the overall average criteria weights for main criteria and sub-criteria and how different their original response is to this average. They are asked if they are willing to revise their response in light of the panel's combined response. The revision of their opinion should not be based merely on the statistics of the criteria weights but also on the related justification. The survey questionnaire is carefully designed to precisely show the differences and show the justifications in a concise manner such that the panel members can think about the other members' opinions and justifications and make a more informed decision about whether or not and how much to revise their original opinion.

The third round survey is customized to each individual panel member. First, a pairwise comparison table is shown highlighting the differences between the member's response and the average response. Then, six questions are presented, one for the main criteria and one for each set of sub-criteria. In each question, the original response and the average response are shown highlighting the major differences and a space is given to provide the revised response. Below the table, the panel member is asked for the basis of the revision (agrees with justification or compromises to reach consensus). Under each question, a discussion is provided showing the major conclusions from the average response and the justifications identified from the responses and comments.

The authors summarize the criteria weights from the third round survey and estimate the new averages and variations in the weights. In the next section, the authors investigate how successful the third round is in reducing the differences in opinions, specifically, the changes in inter-quartile range and the overall range of weights for each criterion. The authors formally conclude the survey by presenting a summary of final criteria weights and some discussion on the remaining differences in opinions among the panel members.

4. Results and Discussion

The primary result from the Delphi process is a criteria system including the weights to be used in the evaluation of transportation funding alternatives. Fig. 3 shows the overall average weights for main criteria and sub-criteria in the form of separate pie diagrams. Sub-criteria weights are shown in the form of local weights, which add up to 100% inside one main criterion. The final weights of all the sub-criteria, also called global weights, are calculated by multiplying the sub-criteria weights by the corresponding main criterion weight. Fig. 4 shows the sub-criteria global weights as a bar chart. Some notable points from these results are listed below:

- The public acceptance and political feasibility (PA&PF), revenue generation (RG) and equity (EQ) criteria have similar weights and are significantly higher than the other two criteria. PA&PF criterion has a slightly higher weight (27%) than the RG and EQ criteria (24% and 25%, respectively). These three together cover about 75% of the total importance. The ease of implementation criterion is given a lower importance (18%). Since the panel members are high-level decision makers in their organizations, they may be thinking about the initial success of a funding policy. In their view, any implementation issues may not pose significant long term challenges, because they may be mitigated through innovation and restructuring.

  Another important observation relates to the PA&PF criterion; not only does it have the largest average weight but it also consistently appears as one of the top two criteria. While the average weights show that PA&PF, RG and EQ are equally important, a closer look at the responses and further investigation may identify that the real consensus opinion is that the PA&PF criterion is the most important.

- The potential secondary benefits criterion, which contains promotion of changes in travel behavior and promotion of fuel efficiency as sub-criteria, receives only about 6% of the overall weight. Based on the panel members' comments, they believe that transportation user charges, at the level of current tax/fee/toll rates, are unlikely to significantly affect public behavior. If these charges are increased, they likely fear a decrease in public acceptance. As the congestion and air pollution increase and resources become scarcer, the policy makers may eventually use the funding policy, along with other measures, to promote efficient use of transportation system.

- The revenue generation potential, revenue sustainability and revenue predictability sub-criteria cover about 80% of the revenue generation criterion. Based on their comments, the panel members believe that the flexibility of investment and the ease of increasing the tax rate are minor challenges and do not merit the same importance as the other sub-criteria. The officials may be concentrating on those issues which are immediate problems and are more visible to the public.

- The user-pay equity sub-criterion covers more than 50% of the equity criterion. The user-pay concept seems to be understood easily by the public and is universally popular, because this concept expands to many public utilities and virtually all free markets. Hence, the panel members seem to give great importance to this concept compared to the ability-to-pay and geographic equity concepts. Insistence on strong performance over these less important criteria appears likely to pose political challenges and work against forming a consensus. With respect to the ability-to-pay equity criterion, the literature (Rosenbloom and Lynott 2011) states that most of the existing and planned funding alternatives do not satisfy this concept well. Poor performance with respect

to ability-to-pay equity may be remediated by providing better mass transit and other programs to those who are negatively affected by the funding policy. For the geographic equity criterion, within Texas, it does not currently appear to pose identical challenges to those readily observed at the federal level; when distributing a nationwide tax's revenue, states often ask for a return of the money collected from their citizens.

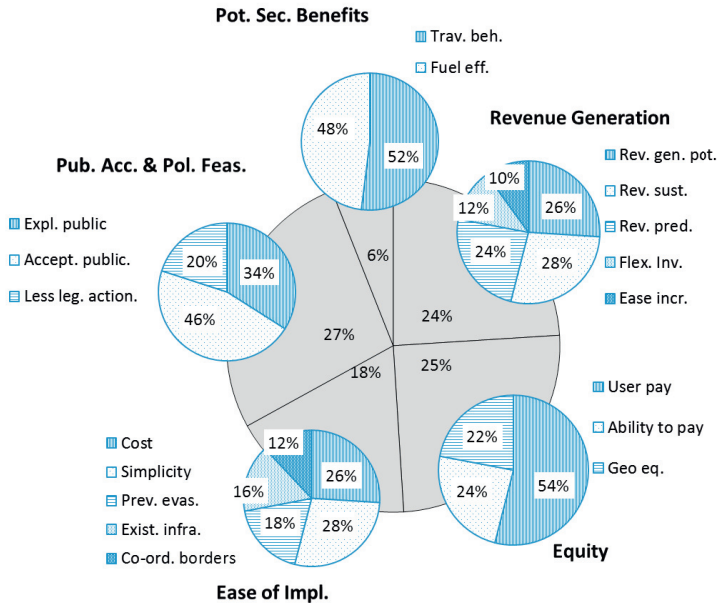


Fig. 3. Overall average main criteria and sub-criteria weights

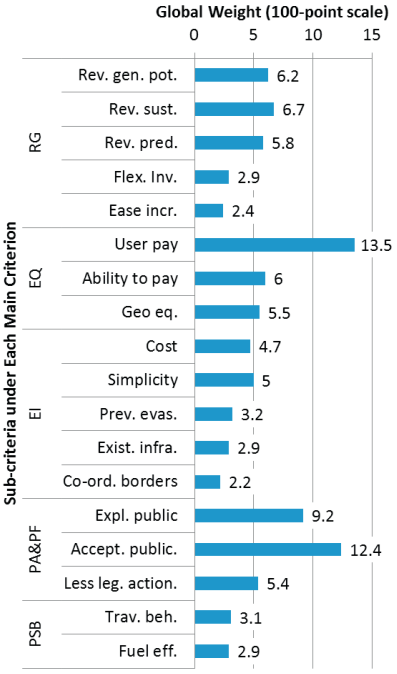


Fig. 4. Sub-criteria global weights

- Overall, user pay equity, ease of explaining to the public and acceptability to the public are the three sub-criteria that stand out. Together, they account for about 35% of the overall weight. These criteria combine to provide an effective measure of public support. When a funding alternative strongly satisfies these, it appears likely to gain support from both transportation officials and politicians due to the citizen support.

- When the panel members are grouped based on whether they represent an urban or non-urban area, the urban group seems to give lower importance to revenue generation than equity and vice versa. The probable reason may be that due to the diverse users in urban areas, implementing equity is more necessary. On the other hand, non-urban areas, due to their low population, may not generate enough local revenue and depend more on a statewide initiative to generate enough revenue.

- When assessing and building a consensus using the Delphi method, the differences in opinions regarding the criteria weights that remain after each survey iteration must be examined. For this panel, many members have revised their responses and assigned weights closer to the round 2 weights. For those who do not respond to the third round, the authors assume that the second round responses are maintained. Overall, the interquartile range of most of the criteria weights decreases indicating that the responses are closer to the consensus. But, often, the range indicated by the lowest and highest weights given to a criterion remains large. This fact is evident from Table 2, which compares the variation in main criteria weights between Round 2 and Round 3 results. The sub-criteria weights experience a greater reduction in variation.

Table 2. Change in variation of main criteria weights between Round 2 and Round 3 (100-point scale)

Criterion	Mean Weight		25%ile Weight		75%ile Weight		Range of Weights	
	Round 2	Round 3	Round 2	Round 3	Round 2	Round 3	Round 2	Round 3
Revenue Generation (RG)	25	24	20	20	31	28	8-36	8-40
Equity and Fairness (EQ)	25	25	20	24	32	28	8-36	12-36
Ease of Implementation (EI)	15	18	12	15	20	20	4-36	10-36
Pub. Acc. Pol. Feas.(PA&PF)	28	27	24	26	31	28	4-36	15-30
Potential Sec. Ben. (PSB)	7	6	4	4	12	10	4-20	4-12

At the end of the survey, the authors identify the following main conflicts in opinions that need to be addressed in future discussions to achieve a better consensus:

- *The revenue generation criterion is the most important because it is the only reason a new funding mechanism is being developed.* There are many alternatives that provide enough revenue. This particular conflict can be reduced by using revenue generation as a threshold criterion wherein a number of candidate alternatives are added to the evaluation list only if they all have a pre-specified revenue generation potential in the long term.

- *The potential secondary benefits criterion should not be included in the evaluation.* Individual panel members may not consider the positive effect altering public behavior may have on accessing future federal funds. This should be addressed by demonstrating the relationship between altering public behavior and federal funding.

- *Under the revenue generation criterion, the flexibility in investment should not be very less important.* This difference may stem from the fact that urban areas may need more varieties of investment than rural areas. This can be addressed by structuring a tax or fee to allow enough flexibility in investment when required.

5. Conclusions and Future Research

The authors establish a criteria system for evaluating transportation funding alternatives based on an expert opinion survey using the Delphi method. They find that, although the search for the new funding methods is due to the existing deficiency in meeting future funding needs, revenue generation is not the most important criterion. Revenue generation, equity and public acceptance and political feasibility are equally important. Furthermore, the criteria weights seem to indicate that the panel members recognize the importance of public opinion and its impact on reaching a legislative solution. Among the eighteen sub-criteria, acceptability to the public, ease of explaining to the public and user pay equity account for more than one-third of the weight. The panelists seem to be less concerned about criteria that may be addressed through research and modifications to the funding options.

Many transportation officials and researchers have argued that the existing fuel tax based system should be replaced with a tax based on vehicle miles traveled or congestion pricing tolls because the existing system does not encourage the public to use the transportation system more efficiently. This study shows that the transportation officials and the political offices who participated in the survey consider the promotion of better travel behavior and better fuel efficiency through a transportation funding policy relatively unimportant. This result shows that the effect on travel behavior is unlikely to influence future transportation funding decisions in the state of Texas. Therefore, these high cost funding alternatives that use a change in public behavior as their primary benefit should receive less future consideration and investment.

This research shows that there are differences among the individuals from different organizations about the evaluation criteria and their relative importance. Collective efforts are needed to reduce these differences so that a successful future funding strategy can be developed. Through the Delphi process, the authors identify an average group opinion and summarize major differences in opinion that need further discussion. This summary can be used in high level discussions by the legislature or the transportation authorities to achieve a better consensus.

Once the evaluation criteria system is finalized, various funding alternatives can be evaluated against this system to develop the best funding strategy for the future. Since the opinions on criteria weights are subjective and include some uncertainty, a concordance approach may be a suitable methodology for the evaluation[2].

Future research may be conducted to validate the results of this study. Some questions to be answered are: how good the panel members understand the objective of the survey and the criteria definitions; and are they considering the criteria independently. There are two ways of thinking: one is to think always in the perspective of public acceptance, that is, what criteria should an alternative satisfy to be accepted among the public and politicians and be implemented? Another is, from a social justice and implementation point of view, what is a 'good' alternative? Here, even though the public may not understand what is 'good', as experts and responsible leaders, the officials should evaluate the alternatives from this perspective. Future research may identify which of the above two is the true perspective of the panel members while they answer the questions.

An immediate extension of this study may be to confirm if indeed the consensus opinion is that PA&PF criterion is the most important. This may be achieved by taking this observation back to the panel members and asking them if they agree with this opinion. Usually, funding alternatives are assigned a score depending on how well they satisfy a criterion. This study does not determine if there is an upper limit for satisfaction, that is, after a certain performance threshold, further increases in performance may not improve the chances of selecting an alternative and may even reduce them. Future research may examine if the panel members think of any criterion in this way. Other future research may investigate if the results from this study may be directly used in other states or countries and if the criteria weights depend on geography and social and political conditions.

References

Acacio, V. (2012). "The Benefits of Face-to-Face Communication."< http://bluejeans.com/blog/benefits-face-to-face-meetings> (June 06, 2013).

Dalkey, N., and Helmer, O. (1963). "An experimental application of the Delphi method to the use of experts." *Manage. Sci.*, 9(3), 458-467.

Gupta, U. G., and Clarke, R. E. (1996). "Theory and applications of the Delphi technique: A bibliography (1975–1994)." *Technol. Forecasting Social Change*, 53(2), 185-211.

Likert, R. (1932). "A technique for the measurement of attitudes." *Archives of Psychology*, 22(140), 5-55.

Linstone, H. A., Turoff, M., and Helmer, O. (1975). *The Delphi method: Techniques and applications*, Addison-Wesley Publishing Company, Advanced Book Program, Boston, MA.

National Research Council (US). Committee for the Study of the Long-Term Viability of Fuel Taxes for Transportation Finance. (2006). *The fuel tax and alternatives for transportation funding*. Transportation Research Board, Washington, D.C.

National Surface Transportation Infrastructure Financing Commission. (2009). *Paying our way: A new framework for transportation finance*, Washington, D.C.

National Surface Transportation Policy and Revenue Study Commission. (2007). *Transportation for tomorrow: Report of the national surface transportation policy and revenue study commission*, Washington, D.C.

Nijkamp, P., Rietveld, P., and Voogd, H. (1990). *Multicriteria evaluation in physical planning*, North-Holland, Amsterdam.

Pulipati, S. (2013). *Evaluation of Surface Transportation Funding Alternatives using Criteria Established through Delphi Survey of Texas Transportation Experts*, Ph.D., University of Texas at Arlington, Arlington, Texas.

Reno, A., and Stowers, J. (1994). *NCHRP Report 377: Alternatives to Motor Fuel Taxes for Financing Surface Transportation Improvements,* Transportation Research Board, Washington, D.C.

Rogers, M. (2001). *Engineering project appraisal: the evaluation of alternative development schemes,* Blackwell Science, Malden, MA.

Rosenbloom, S., and Lynott, J. (2011). *Transportation Funding Reform: Equity Considerations for Older Americans.* Rep. No. 2011-03, AARP Public Policy Institute, Washington, D.C.

Skulmoski, G. J., Hartman, F. T., and Krahn, J. (2007). "The Delphi method for graduate research." *Journal of Information Technology Education*, 6, 1-21.

United States Census 2010. (2013). "Most Populous Places."<http://www.census.gov/2010census/popmap/> (June 20, 2013).

Zhou, S. (1996). *The development and evaluation of aggregation methods for group pairwise comparison judgments*, Ph.D, Portland State University, Portland, Oregon.

[2] Readers may refer to "Engineering Project Appraisal" written by Rogers (2001) for further information on concordance methods.